DOCUMENT RESUME

ED 325 626 CE 056 121

TITLE	Educational Imperatives for Oral Health Personnel: Change or Decay? Report of a WHO Expert Committee. Technical Report Series 794.
INSTITUTION	World Health Organization, Geneva (Switzerland).
REPORT NO	ISBN-92-4-120794-9; ISSN-0512-3054
PUB DATE	90
NOTE	49p.
AVAILABLE FROM	WHO Publications Center, 49 Sheridan Avenue, Albany, NY 12210 ($4.80).
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	*Allied Health Occupations Education; *Dental Health; Dental Hygienists; Dental Technicians; *Dentistry; *Dentists; Educational Change; Educational Needs; *Employment Qualifications; Foreign Countries; Job Skills; *Medical Education; Postsecondary Education; Professional Education; Technological Advancement

ABSTRACT

This report highlights trends in disease patterns and technological advances that call for sweeping changes in the education of oral health personnel. It first provides a brief history of the development of dental education. The second and most extensive section analyzes global trends for dental caries, periodontal conditions, tooth loss and edentulousness, developmental disorders, systemic diseases, and traumatic injuries. The third section considers what these trends will mean in terms of the demand for different categories of oral health personnel and for low-, moderate-, and high-technology care. The report notes that the clinical functions required of oral health personnel will change from the simple to the complex. The second half of the report discusses the immediate educational changes needed to protect against an oversupply of oral health personnel, overqualified for routine clinical functions yet inadequately trained to perform necessary specialized, sophisticated procedures. Topics include advantages of a health sciences approach organized on modular lines, changes in curricula that can support revised educational objectives, and methods for setting and maintaining educational standards. Fifteen specific tasks that can contribute to effective changes in educational systems for training dentists and auxiliary personnel are outlined. Eleven references are listed. Appended is a statement of the general aim and objectives for a first course for oral health professionals. (YLB)

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Educational imperatives for oral health personnel: change or decay?

Report of a
WHO Expert Committee

Technical Report Series
794

World Health Organization, Geneva 1990

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WHO Library Cataloguing in Publication Data

WHO Expert Committee on Educational Imperatives for Oral Health Personnel: Change or Decay?
Educational imperatives for oral health personnel : change or decay? : report of a WHO expert committee.

(World Health Organization technical report series ; 794)

1.Education, Dental – trends 2.Dental care – trends I.Title II.Series

ISBN 92 4 120794 9 (NLM Classification: WU 18)
ISSN 0512-3054

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PRINTED IN SWITZERLAND

90/8446 - Schüler SA - 6500

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Geneva, 6–13 November 1989

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EDUCATIONAL IMPERATIVES FOR ORAL HEALTH PERSONNEL: CHANGE OR DECAY?

Report of a WHO Expert Committee

1. INTRODUCTION

The WHO Expert Committee on Educational Imperatives for Oral Health Personnel met in Geneva, Switzerland, from 6 to 13 November 1989. Dr V. Fattorusso, Director *ad interim*, Division of Drug Management and Policies, opened the meeting on behalf of the Director-General. Recalling that the last time a WHO Expert Committee had discussed dental education had been in 1962 and that significant changes had occurred in oral health status since that date, Dr Fattorusso emphasized the timeliness of the meeting and the heavy responsibility of the members of the Expert Committee to guide dental education towards fundamental restructuring appropriate to those changes.

The strategies and concepts of health care promoted by WHO call for equitable distribution of services, implementation with minimal delay of research results and new technology, efficient allocation of resources, increased flexibility of health personnel through broadened education, and response to the changing demands of an increasingly well-informed public.

All of these elements are important in the changing world of dentistry and were reflected in the Committee's terms of reference, which were:

- To consider the changing needs and demands for oral health care, and the types and mix of personnel required in the future.
- To propose educational goals and curricula to enable future health objectives and training requirements to be met.
- To review the influence of new technologies on future training and education.
- To recommend an educational structure that would promote closer understanding between various types of health personnel.

- To identify a core curriculum for health sciences that would permit students to change from one discipline to another with minimal disruption of studies.
- To formulate recommendations regarding licensing, relicensing and vocational training for oral health personnel.
- To identify actions required within governmental, professional and educational organizations and institutions to facilitate any necessary changes in existing educational structures and approaches.

The Committee agreed to address these terms of reference in a broad context and to be restricted neither by the currently accepted confines of dental practice nor by existing categories of oral health personnel.

2. THE DEVELOPMENT OF DENTAL EDUCATION

Since emerging from its origins in the traditional barber-surgeon apprenticeship systems, dental education has undergone an evolutionary process in its efforts to keep pace with increasing knowledge and changing circumstances. As administered by most countries, most such education is now provided through the university system: the prospective dentist studies to acquire a degree and may then apply for a licence to practise.

In many countries, dental education has traditionally been organized by subject. The first subjects studied are basic sciences, followed by preclinical and clinical sciences. Since the aim of teaching has always been to produce licensed dentists, according to the accepted professional model, this system has tended to be perpetuated. Some dental schools have reorganized curricula into integrated units, allowing the same course contents to be covered in a different sequence. Another innovation adopted by certain dental schools has been the implementation of a problem-solving approach to the learning process.

Since the major oral problem has been dental caries, with its sequelae of pain, extractions, and replacement of missing teeth, the major focus of the curriculum has always been on the teaching of procedures designed mainly to relieve pain and provide restorative and rehabilitative treatment. Little time has hitherto been available in the teaching curriculum or in the dentist's practice for considering

other oral problems. In many countries, furthermore, there has been little or no education in the broad principles of health and systemic disease.

Since the publication in 1962 of a WHO Expert Committee report on dental education (*1*), many of the precepts outlined in that report have been followed and have helped to bring about a dramatic reduction in the prevalence of the major diseases upon which they concentrated. "Health through oral health" has become the motto of the dental profession.

Research has brought about a better understanding of the etiology of oral disease processes, and thus an improvement in oral health in most countries. Oral health education and the use of fluorides, antimicrobial agents and chemotherapeutic drugs have also had a significant impact on the management and prevention of disease.

Research into new biomaterials has identified various substances of great value in the reconstruction, and re-establishment of function, of the oro-facial complex. Such materials have subsequently found considerable application in other areas of the health sector.

Researchers in oral sciences are currently investigating sophisticated methods for early diagnosis of diseases, including the use of molecular biological methods. Moreover, regenerative techniques are likely to be used increasingly in treating oral disease in the future; these techniques include stimulation of local bone growth and guided tissue regeneration, which involves the implantation of a "matrix" of appropriate biomaterials to direct the formation of new tissue.

The challenge of the future will be to find cost-effective ways of making these advances available to the community through national oral health services. This will require expansion of the scientific basis of oral health education, to integrate it more closely with other disciplines, notably biological and health sciences. Educators, planners and governments should take a bold approach to changing the organization of oral health services, education and personnel, which has until now largely followed traditional patterns.

3. CHANGING DISEASE PATTERNS INFLUENCING NEEDS AND DEMANDS FOR ORAL HEALTH CARE

In recent times, routine dental work in many countries has been concerned mainly with the management of caries and periodontal diseases and their sequelae, i.e. with relieving pain, restoring or extracting teeth, and making prosthetic appliances. Dentists could and should, however, be attending to a wider range of oral conditions and diseases, including, for example, lesions of the oral mucosa, problems of the temporomandibular joint, disorders of occlusion, and the results of trauma, as well as becoming more involved in broader health issues, and in programmes for the promotion of oral and general health.

Such responsibilities are not universally constant or consistent, but are subject to influences that affect their relative importance in different countries and different regions. Comprehensive, reliable and useful data on dental caries—the commonest dental disease in most countries—have been obtained from epidemiological surveys and stored in WHO's Global Oral Data Bank. Data on other significant oral health problems, however, are comparatively incomplete—because suitable methods of measurement have not yet been established, have been developed only relatively recently or have not been widely applied, or because surveys have involved inadequately representative samples of populations. For the purposes of planning the necessary types and mix of oral health personnel and the education they require, it is important that as accurate information as possible is obtained concerning the prevalence of, and projected trends in, significant oral diseases and disorders. At any one time, prevalence of these diseases and disorders will differ from country to country and region to region; regular monitoring by means of well planned epidemiological surveys using appropriately standardized methods is therefore essential. The frequency of monitoring may vary, but five years is a bench-mark figure that is considered acceptable. WHO's manual on basic methods for oral health surveys (*2*) provides a methodology for this monitoring: WHO has also recently issued a set of criteria, plus recording forms,[1] for the collection of data regarding oral

[1] Available from Oral Health, World Health Organization, 1211 Geneva 27, Switzerland.

manifestations of infection with human immunodeficiency virus (HIV).

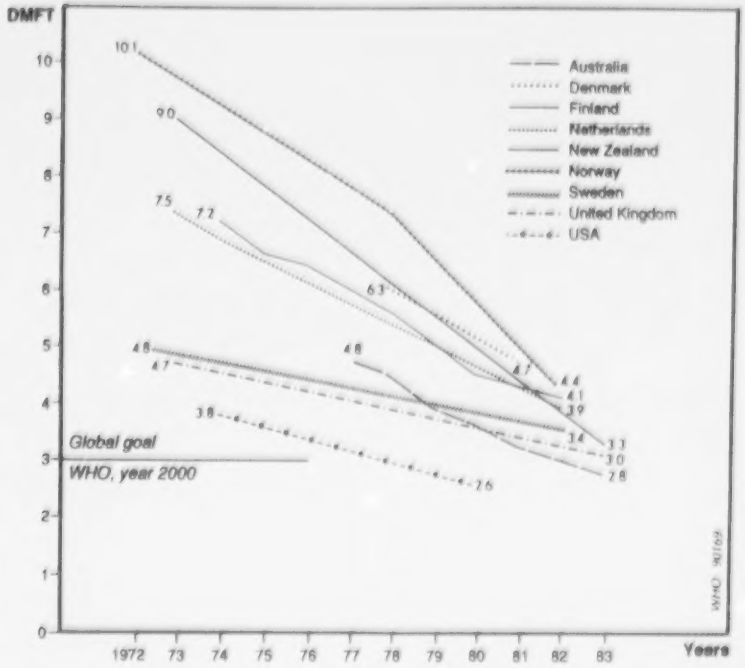
3.1 Dental caries

Dental caries has been known throughout history, but started to become a significant health problem in industrialized countries in the latter part of the nineteenth century, when new technology allowed production of large amounts of refined sugars. The development of caries within populations has followed different patterns in different parts of the world, but in most highly developed countries there was a sharp increase in prevalence and incidence of the disease during the 1920s to 1950s. Caries became recognized as a major oral health problem in such countries, notably in the 1950s and early 1960s, when demand for care increased, and some countries recorded that almost no children were free from caries. Figures for decayed, missing, and filled teeth (DMFT) as high as 10–15 were reported for children aged 12–14 years. Whole populations were affected by a painful and distressing disease to which large amounts of public and private resources were allocated, not only to provide a professional workforce and the finances to treat the disease, but also for the investigation of possible ways to prevent it.

Scientific research has been successful in showing, for example, that addition of small amounts of fluoride to drinking-water or other vehicles (e.g. salt, milk), plus reduction of sugar intake, could dramatically decrease the prevalence and severity of dental caries. The increased use of fluorides from all sources, especially toothpastes, is undoubtedly the major factor in reducing dental caries in many parts of the world, but a variety of other factors also contribute to this. As a consequence, evidence of a decrease in dental caries among children in highly industrialized countries started to emerge around 1970, and percentages of caries-free children in different age categories have increased since then.

The reduction in caries is vividly illustrated by the DMFT figures for the key age group of 12 years as compiled by a joint Working Group of the International Dental Federation (FDI) and WHO (*3*). Fig. 1 is based on its report; it also highlights the level of 3 DMF teeth as a global goal for oral health according to the World Health Organization's overall goal of health for all by the year 2000. Starting with DMFT figures as high as 7–10 in the early 1970s, most of the countries shown reported DMFT figures of 3–4 ten years later.

Fig. 1. Trends in dental caries 1967–1983: DMFT at 12 years



The majority of the populations represented in the graph were expected to have reached levels below 3 DMF teeth by 1990. The reduction in disease intensity is actually much greater than the graph indicates, as many teeth had two- or three-surface lesions during the high-caries period, whereas the majority had only one-surface lesions ten years later. The improvement is thus much more pronounced than would appear at first sight.

Whatever the exact reasons for the improvement, there is no doubt that the reduction in dental caries prevalence is real. It has been suggested that the change may be associated with non-etiological factors; however, only a minor part of the decrease in dental caries can be attributed to a change in diagnostic criteria or in treatment philosophy. Despite the favourable trends observed, there is still room for improvement; for an individual to have no

carious teeth should be considered a desirable and achievable goal. Nevertheless, care must be exercised in the interpretation of data on average DMFT figures to avoid overlooking those children who may still have many carious teeth. For this reason, the monitoring of populations and screening for groups or individuals at high risk of dental caries, as well as the detection of sudden reversals in favourable trends, will be one of the primary tasks of public health dentistry in the future.

The declining prevalence of dental caries has continued from childhood to teenage and adolescence, with young adult populations enjoying similar benefits in many highly industrialized nations. In some countries (e.g. the Netherlands) the first age cohorts experiencing conspicuously less caries have probably now reached around 30 years of age, and the expectation is that this trend will continue into later life. What remains to be determined is whether the retention of more teeth for a longer period of time may be compromised by an increased tendency to fracture and wear in old age.

Some areas that have more recently undergone industrialization have experienced a different pattern in the prevalence of caries. In Hong Kong, Malaysia and Singapore, for example, prevalence was low (less than 2 DMF teeth at 12 years of age) in the 1930s and early 1940s, but rose to at least moderate levels in the 1960s (4 or 5 DMF teeth) and has recently fallen again to previous levels. This has occurred largely because of the early introduction of community preventive programmes which have been based especially on the optimum use of fluorides.

Certain developing countries have reported an increase in dental caries in recent years (e.g. India and parts of Central and South America). The explanation for this is most probably related to the increased availability and consumption of refined sugars. Concern has also been expressed about the apparent relationship between caries and the trend towards urbanization in many developing countries: as people leave established rural living conditions and move to large cities where they are exposed to modern eating habits, there is an increasing risk of dental caries. There are few resources for a curative/restorative approach, and no infrastructure upon which to base large-scale measures for prevention. Dental caries is therefore potentially of major public health significance in developing countries and the need to focus on its prevention is a matter of urgency.

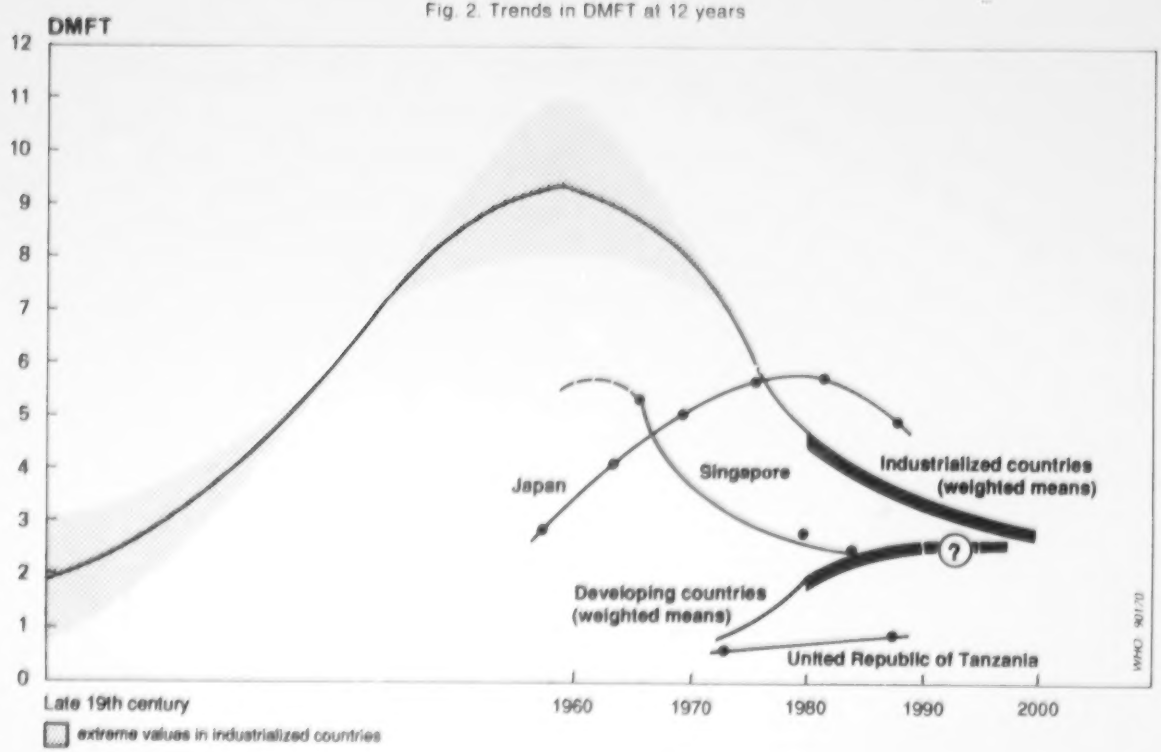
Among the oral health goals for the year 2000 announced in 1980 was that of achieving a worldwide mean DMFT figure of 3 at the age of 12 years (*4*). It was stressed at the time that, although this would represent a mild increase in caries prevalence globally, a much greater increase could be expected if existing trends were to continue and available preventive measures were not widely utilized. For the first few years of the 1980s, the rising trend of caries incidence in developing countries, accounting for 75% of the world's population, outweighed the opposite trend in the industrialized countries. An overall average of 3 DMF teeth was rapidly approaching, with a figure of 2.9 recorded in 1984. Now, however, it appears that the battle for prevention has largely been won and that the global mean figure for DMFT will remain below 3; with continued efforts, the global average may be well below this level at the end of the century.

The sequence of increasing caries prevalence, followed by development of sophisticated oral health services and then effective prevention of caries has occurred over 100 years or more in industrialized countries (see Fig. 2). This process has already taken place, in a shorter time, in some developing countries and is progressing in others, where it is believed that the cycle will also be much shorter and that the peak DMFT levels reached will be significantly lower. This has been shown in the experience of Hong Kong and Singapore where available data suggest that the period from increase to decline in caries prevalence has been 30–40 years and the highest mean DMFT scores in the range 4–5 at 12 years of age. There is well documented evidence of a similar pattern in Japan which, though now a highly industrialized country, changed its diet and suffered an increase in caries later than other such countries. There, the mean DMFT for 12-year-olds rose from 2.8 to 5.7 between 1957 and 1975, but has recently fallen to 4.9 (1987). However, it is also important to realize that many developing countries may not experience this process at all.

3.2 Periodontal conditions

Although almost every person has some periodontal disease, recent epidemiological studies indicate that the more severe stages are not as prevalent as was once thought. Survey results from many countries using the Community Periodontal Index of Treatment Needs (CPITN) have been analysed and stored in the WHO Global Oral Data Bank. There were almost no completely healthy subjects

Fig. 2. Trends in DMFT at 12 years



in the key age group of 35–44 years; however, the most frequently observed conditions were the relatively superficial indicators of calculus and shallow pocketing (4 or 5 mm deep) around the teeth. With a few exceptions, the percentages of persons, and the mean numbers of sextants per person, affected by deep pocketing (6 mm or more) were small or very small. This finding is even more striking when the low mean number of sextants with fewer than two teeth and the estimated national levels of edentulousness are taken into account. The frequently expressed view that periodontal diseases are the main cause of tooth loss is not supported by the available data. Tooth loss as a result of periodontal diseases is uncommon before the age of 50 years.

In the age category of 35–44 years, it is also interesting to note the absence of clear differences between industrialized and developing countries for the more severe stages of periodontal diseases. The view that periodontal diseases in this specific age group are a much greater problem for developing countries is not supported by the evidence. Differences in standards of oral hygiene between highly industrialized and developing countries are more apparent.

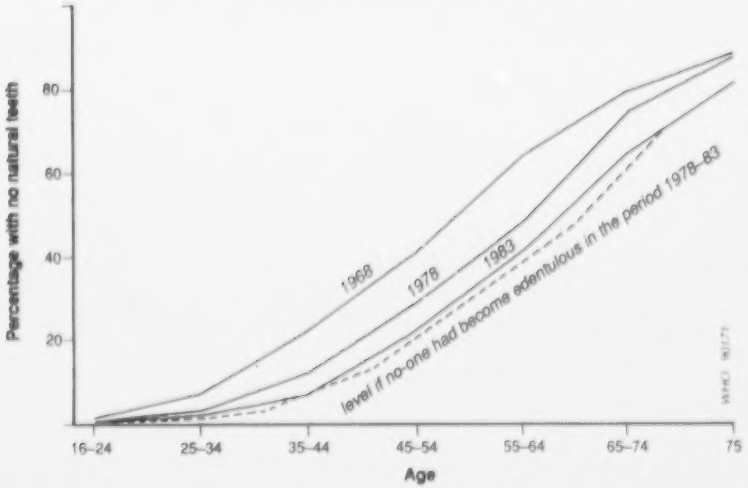
CPITN data show that young adults (15–19 years old) in developing countries have high levels of calculus and of bleeding on probing, probably associated with poor oral hygiene. However, severe periodontal destruction at age 35–44 years seems to be a limited problem in most of the developing countries surveyed.

Reliable data for periodontal conditions in older age groups are unavailable for many countries. However, it is clear that the prevalence and severity of periodontal tissue destruction increase with age, and this also has a bearing on the potential for root caries. In view of increasing life expectancy, therefore, the key question to be resolved is whether the progression of periodontal diseases is inconsistent with the lifelong retention of a functioning and socially acceptable (within a given culture) dentition. There is inadequate information on the destructive process of these diseases in the older age groups of different populations and on whether such factors as genetic background or nutritional status might have a greater influence than senescence on susceptibility to breakdown of periodontal tissue. A further point for consideration is whether the presence of periodontal diseases may have a deleterious effect on general health through systemic mechanisms as yet unidentified.

3.3 Tooth loss and edentulousness

While the most significant causes of tooth loss are still dental caries and periodontal disease, the populations of some countries have experienced a marked improvement in the survival of their teeth in recent years. This has occurred particularly in younger age groups and is largely associated with a sharp decline in dental caries; moreover, periodontal diseases are no longer considered a major contributor to tooth loss before 50 years of age. One measure of tooth loss is the level of edentulousness in a population, and there have been recent encouraging trends in some countries with a history of relatively high levels. An excellent example is provided by a 1983 survey of adult dental health in the United Kingdom (*5*), which provides interesting data on edentulousness. Fig. 3 is a reproduction of the original graph representing percentages of adults with no natural teeth, by age, between 1968 and 1983 in England and Wales.

Fig. 3. Percentage of edentulous adults in England and Wales



The steady decline in edentulousness is evident: over all groups aged 16 years or more, 37% were edentulous in 1968, 29% in 1978, and 25% in 1983. Most interesting of all is the dotted line in the figure, indicating the absolute minimum level if nobody had become edentulous in the period 1978–1983. Because the loss of natural teeth

is an irreversible condition, the amount of improvement that can take place over any particular time period is limited by the number of people who are already edentulous at the start of the period. The percentages of edentulous people in each age group in 1983 were very close to the lowest levels that could have been achieved, given the numbers of people already edentulous in 1978. Obviously, very few persons became edentulous in that 5-year period in England and Wales.

3.4 Developmental disorders

Relatively minor malpositioning of the teeth is comparatively common, though for this and the more severe forms of malocclusion that threaten function and health there are as yet no satisfactory, standardized survey methods to enable international comparisons to be made. Demand for treatment is high in some countries but the cost is often considerable and objective predictors of likely successful outcome are currently unavailable. Moreover, it is not yet possible to quantify future treatment needs and the resources they will require. Where caries rates in childhood are in decline and fewer teeth are lost in the developing dentition, it is not altogether clear what the consequence will be in terms of the prevalence of malpositioned teeth. The demand this may make on oral health personnel to be involved in the management of disorders of occlusion is also unclear, and will in any event be influenced by prevailing sociocultural attitudes to the aesthetic appearance of the teeth.

Other conditions of a developmental nature that require a major contribution from oral health personnel can be seen at different stages of life; they include cleft lip and palate, functional disorders of the temporomandibular joint, and effects of the aging process. There are few indicators of trends in terms of international comparisons; the prevalence of these conditions in each country needs to be determined, so that the educational implications of altered requirements for oral health personnel can be assessed.

3.5 Systemic diseases

Many systemic diseases present with manifestations in and around the oral cavity, particularly in the oral mucosa. It is therefore

important that oral health personnel are adequately educated and trained to recognize diseases of the oral mucosa and of associated tissues, as well as to take appropriate steps for their management. Examples of significant changes that can be expected to occur are those associated with medical advances such as in transplant surgery, irradiation and drug therapy, and the increasing prevalence of oral manifestations of HIV infection.

Immunocompromised patients, who may be otherwise well controlled by medication, will in future represent an increasing challenge for oral health care personnel. This will mean not only new problems of diagnosis and management but also new requirements for special precautions during treatment, especially in terms of the adequate control of cross-infection.

Malignant tumours of the mouth and adjacent tissues represent a significant proportion of the total burden of malignancy worldwide (6). Those responsible for oral health need an awareness of the manner in which such conditions can affect other anatomical structures in the head and neck region. Caution is required in the interpretation of data that combine cancer of the mouth with cancer of the head and neck overall, and that may have been obtained from unrepresentative populations (such as hospital patients). Where they do not already exist, national cancer registries should be established to provide adequate data bases. Nevertheless, it is apparent that widely divergent trends can be recognized internationally and that the distribution of oral cancer between sites or between the sexes shows considerable variation from country to country, largely because of differences in exposure to etiological factors. In some parts of the world, oral cancer represents a major oral health care problem and requires a team approach for its management. Precancerous lesions and conditions of the oral mucosa assume corresponding significance and will also require the development of skills in the recognition and management of oral mucosal abnormalities.

3.6 Trauma

Epidemiological data on traumatic injuries to the teeth and associated tissues are extremely scarce. However, control of the prevalence of violence, whether related to criminal, civil or military activity, and of injuries associated with the misuse of alcohol, weapons, motor vehicles or machinery, is unpredictable, and the

management of oral injuries will therefore continue to assume a significant role in oral health care.

4. TYPES AND MIX OF ORAL HEALTH PERSONNEL REQUIRED IN THE FUTURE

Oral diseases, national economies and health infrastructure differ widely throughout the world, but most countries can be classified in one of the following three categories:

Highly industrialized countries. There has been a conspicuous decline in caries in highly industrialized countries, and probably a decrease in periodontal diseases; there is thus a clear need to modify significantly the approach to the training and practice of future oral health professionals and auxiliaries. The "ripple" effect of changes in disease prevalence must be kept in mind, with a focus on eventual stability through minimal "hands-on" intervention in caries and periodontal diseases, together with carefully planned intervention for other oral diseases. Indications for some types of treatment, particularly orthodontics and removal of impacted third molars, are currently subjects of debate. It is also estimated that the increasing number of elderly people maintaining their natural dentition for life will provide a substantial reservoir of oral disease problems and demands for care. Moreover, management of oral disease problems in elderly patients will become more complex because of medical complications, the treatment such patients may be receiving, and the need to understand and coordinate medical and oral care procedures. The highly industrialized countries currently have a comparatively large oral health workforce, especially dentists, and the changing pattern of disease and treatment requirements has created underemployment and unemployment of dentists in some places (e.g. some Scandinavian countries). Other influences have a bearing on the situation: for instance, governments may directly or indirectly ration the availability of oral health care through fiscal and funding policies.

Newly industrialized countries. Newly industrialized countries will eventually be classifiable with those that are highly industrialized, but the "ripple" of moderate to high caries rates has yet to move through the age cohorts, affecting sequentially the services needed

and retarding the achievement of stability. There are apparently adequate numbers of oral health personnel, with dentists and operating dental auxiliaries sharing the workload.

Developing countries. Some developing countries have experienced either no change in the initially low to very low caries prevalence or only minor changes (e.g. China and some African countries). Provided that this status can be maintained, a minimal intervention approach for caries is appropriate. Other developing countries, however, have suffered substantial increases in caries prevalence (e.g. India and some countries of Central and South America). It remains to be seen whether these increases are continuing or whether they have been halted or reversed. In any event, large-scale preventive intervention will be needed, and it will also be necessary to deal with a significant pool of residual disease over the next 20–30 years. However, all countries should start planning for changes to a multidisciplinary, primary health care strategy in community-level care (and referral for more complex services) as well as for changes in educational policy. In pursuit of this, continuous monitoring through the collection and interpretation of data on oral diseases and on the community aspects of oral health is clearly essential.

In all three situations outlined above, there continues to be an imbalance in the distribution of available resources. Those people least in need of care or health education frequently receive most, while those most in need receive least. "Health for all" requires a fundamental move towards a more equitable distribution of health care.

Other factors to be considered in the highly industrialized countries are the functions currently undertaken by oral health personnel and those that might be expected of them in the future. Graphs have been produced (see Fig. 4) to represent the distribution of high-, moderate- and low-technology functions (or high, medium and low levels of intervention) in industrialized and developing countries (7).

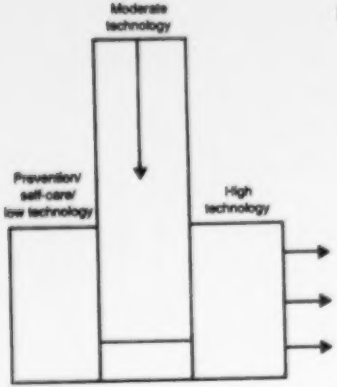
In Fig. 4a, for highly industrialized countries, straightforward conservative care of the teeth, uncomplicated extractions, and simple, removable prostheses are represented by the large central part of the graph. In contrast, high- and low-technology functions (which do not necessarily equate with high and low cost) form a smaller percentage of the quantity of care available and delivered.

The significant improvements in oral health in most industrialized countries have led to a selective and large reduction in the moderate-technology/medium intervention functions forming the bulk of the middle column of Fig. 4b. It is anticipated that the need for this level of care will continue to diminish over several decades. In terms of further emphasis on prevention, the same level of need will probably persist for low-intervention functions, including prophylaxis, removal of calculus and subgingival scaling, application of sealants, and the restoration of simple, one-surface cavities. This area may even increase slightly as new techniques are developed. However, it is also possible that many future preventive and health promotion activities will not be undertaken primarily by oral health personnel but by more broadly based individuals who will be responsible for maintaining community awareness of the causes of oral diseases.

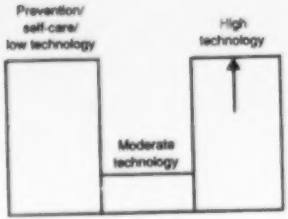
The proportion of the population taking advantage of oral health care services varies from country to country but in only a few might it be considered optimum. Total coverage is an unrealistic goal, but steps should be taken by each country to ensure that all those who wish to avail themselves of oral health care services are able to do so.

It is also suggested that the effects of improving oral health, and the consequent diminishing need for moderate-technology intervention procedures, will for several decades proportionately increase the need for high-technology procedures. With higher priority for the preservation of natural dentition, and a demographic shift towards older populations, the move towards higher technology will be accentuated. The clinical functions required of oral health personnel will thus change from simple restorations, prostheses, and extractions, to precision prosthetics, orthodontics, complex surgery, and oral medicine, all based on comprehensive examination, diagnosis, and treatment planning. Other, non-clinical functions will polarize into the areas of strategy selection, planning, organization, and evaluation on the one hand, and health promotion and preventive programmes on the other. It can be predicted that the effect of the changes in oral health status will be to force dentists who have worked mostly at the moderate-technology/medium-intervention level towards either extreme. Some will begin to perform the work previously undertaken by specialists, and should be encouraged to seek appropriate postgraduate training. Others will shift to the low-technology procedures and begin to perform tasks for which their education and experience make them over-qualified. A particularly undesirable effect of this trend would be

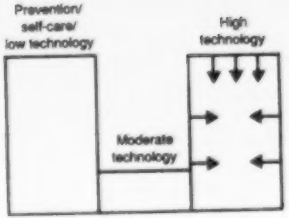
Fig. 4. Changing patterns of tasks in oral health care



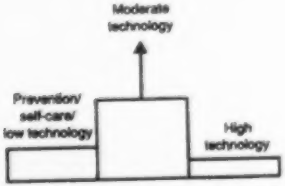
(a) Changes in distribution of tasks in oral health care from past to present in highly industrialized countries



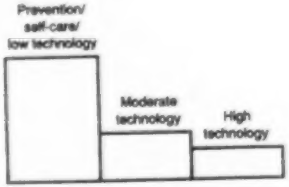
(b) Distribution of tasks in oral health care in highly industrialized countries



(c) Future distribution of tasks in oral health care in highly industrialized countries



(d) Typical distribution of tasks in oral health care in developing countries



(e) Future distribution of tasks in oral health care in all countries

financial pressure to provide unnecessary treatment, especially if the quantitative planning of manpower has been inappropriate or nonexistent. The system of payment that depends upon dentists demonstrating that specific items of treatment have been carried out can also be detrimental in this respect.

Now and in the immediate future, dentists in the highly industrialized countries should be guided, through expanded opportunities for retraining and continuous education, into undertaking more complex technological procedures. The simpler procedures could then be undertaken more economically but equally well by various categories of auxiliary personnel. In the more distant future, perhaps 40 years or more ahead, demand for even the more complex procedures might be expected to diminish; far fewer professional oral health personnel would then be required (see Fig. 4c). However, these personnel would need to have a broad education in allied health sciences, of which oral health should be a fully integrated part.

For those developing countries where caries is increasing and the number of dentists is also rising, there will continue to be an increase in the demand for moderate-technology procedures over the next few decades (see Fig. 4d). In the more distant future, it is envisaged that these countries, and those that still have a low to very low prevalence of caries, should follow the strategy of primary health care, concentrating on low-technology procedures for the majority of their oral health services. In this way, it is anticipated that services will reach similar structural patterns in both developing and highly industrialized countries (as shown in Fig. 4e).

It is also essential that problems in the health care system in which oral health personnel work be addressed. Thrusting health professionals and auxiliaries into inefficient and poorly administered systems that fail to utilize appropriately their training and expertise is wasteful. If they are to have an impact on oral health, progressive changes in the education of oral health personnel must be accompanied by appropriate modifications and structural changes in the oral health care delivery systems. Dental educators and health planners must work together to ensure that the numbers of oral health personnel qualifying are consistent with the number, scope and quality of the settings in which they have to practise. Where necessary, existing personnel should be provided with the opportunity to receive suitable training or retraining to enable them to undertake new tasks for which demand will be high.

In the immediate future all countries will be faced with the problem of reorganization and transition of the oral health workforce, and each must take the actions it sees as appropriate. Longer-term strategies must be adopted for the implementation of more fundamental changes. Essential steps on the way to this new approach could include the realization that:

- The need for care of the common oral diseases of yesterday, and even of today, will diminish to a considerable extent.
- Other oral diseases will probably not reach a prevalence that would support a dental profession of present-day proportions unless new areas of concern arise. These are most likely to be in areas that currently tend to fall "between the cracks" in the education of today's physicians and dentists, such as nutrition, aberrations of taste and smell, speech pathology, growth and development, and certain other diseases in the head and neck region. In this event, such topics should be included in the education and practice of the future oral health professionals.
- Interventive work and high-technology dental implants and prosthetics will be important, as will orthodontics, but they are unlikely to cushion the impact of diminishing need for treatment of caries and periodontal diseases for more than 3–4 decades.

It will also be essential to recognize that:

- A clear new policy is needed as soon as possible, which will include firm choices between the various alternative approaches.
- This policy and operational plan must cover the education and training of all types of oral health personnel and retraining of those already in the workforce by the time implementation of the plan commences.
- The prime objective of the whole policy and plan is to provide appropriate personnel for care of a country's oral health, and that this cannot be achieved simply by adjusting the numbers and sizes of existing dental schools or without thorough revision of the educational process and the content of courses.

The personnel that comprise an oral health team can be categorized as follows:

- Ancillaries, i.e. non-dental personnel such as primary health care workers, health educators and schoolteachers.

- Auxiliaries, i.e. dental therapists, dental hygienists, dental assistants and dental laboratory technicians.
- Professionals, i.e. academically educated staff with varying degrees of specialization.

The optimum mix and utilization of these categories within an oral health team are essential for any country if it is to achieve the most economic, yet adequate, oral health care for the population. All countries, not only the developing countries, face economic problems of varying severity and have had to realize that, while health spending is increasing rapidly, there is not necessarily an accompanying improvement in the general health of the population. Although oral health is an exception to this pattern, design of an optimal oral health care system, with a budget that consumes a large percentage of the overall health allocation, is no longer realistic; in any event, oral health has to compete for funds with many other demands on the health care system. Politicians and governments do not always ask for optimal services but for what is "good enough", requiring the profession to defend proposed solutions in the light of the current economic situation in each country. Nevertheless, it is important that there is sufficient support to maintain past successes and to ensure adequate oral health services for the future.

Salaries and staff training costs are the major items of expenditure in all health budgets, and it is thus essential to plan for future oral health care services to be delivered by the most appropriate but least expensive category of personnel in terms of training costs and salary. Low-technology non-interventive services, for example, which will constitute the major part of future oral health tasks, could be carried out by auxiliary or ancillary oral health workers. This is already the case in many developing countries, but all countries should re-evaluate their needs in the light of their particular economic circumstances, the structure of their health care systems, and prevailing disease patterns.

Where high-technology procedures, and an understanding of the underlying scientific principles, are concerned, highly trained "dentists", "oral physicians", or "clinical health scientists" with further specialist training are essential. None of these, however, can function alone: the team approach has shown many advantages in the past and will become even more relevant in the future for both economic and professional reasons.

Changes in the mix and type of oral health personnel are thus needed in the long term. It can be predicted that, by the year 2030, certain well established components of oral health care systems will have a sharply diminished role. For example, the dental drill will probably be restricted to use in crown and bridge preparations and some bone surgery, and scalers may become unnecessary if calculus formation is controlled or eliminated by chemical means. Dental schools could be incorporated into schools of health science within which a wide range of special health qualifications could be pursued after an initial, broad education. The successor to today's dentist may be a broadly based health professional who might be described as an "oral physician", "clinical health scientist", or some similar title, and will probably work closely with more general health care facilities as well as in a conventional practice setting.

It is possible for each country to analyse critically the structure, scope and personnel categories of its oral health delivery system in relation to the prevalence and trend of oral diseases, especially caries and periodontal diseases. Changes in the mix and types of personnel dealing with oral health could be planned with reference to existing health policies and goals, and to present and future economic conditions. A manual and computer program to that effect are available from the Oral Health unit of WHO.[1] It can be confidently predicted that the numbers of oral health personnel, particularly dentists and dental assistants, will decline. An "oral physician" or "clinical health scientist", aided by a small number of auxiliaries, will be able to deal with much larger numbers of the population than has been the case in recent years. However, the goals for the numbers and scope of each category must be set by individual countries.

5. INFLUENCE OF NEW EDUCATIONAL, SCIENTIFIC AND TECHNOLOGICAL DEVELOPMENTS

5.1 Educational developments

By about the year 2030, it is likely that educational philosophies will have evolved to take more account of the concepts of greater

[1] *Health through oral health: guidelines for planning and monitoring for oral health care*. London, Quintessence, 1989. Available from Oral Health, World Health Organization, 1211 Geneva 27, Switzerland.

community participation, the well-being of society as a whole and increasingly flexible attitudes to educational opportunities. There should also be much greater equity in the delivery and accessibility of health care services. Ideally, there will also be greater integration between research, service provision and teaching, greater concentration on the subordination of theory to practice, some modification of treatment rooms, equipment and materials to meet local circumstances, greater accountability to governments and the community, and the breaking down of barriers between different hierarchical levels of the health care service.

These considerations apply as much to oral health as to any other aspect of the provision of health care and trained personnel. For example, account needs to be taken of the view that the education of oral health care personnel should take place not only in centralized and specialized facilities but also in the community where care is most required.

Advances in educational techniques should be reflected in the education of oral health personnel. Technical developments in this field, such as in data-processing, modular systems, computer-assisted learning and video-disc technology, would assist students in self-assessment of their achievements. Performance simulation might also be a valuable adjunct in many areas of training, and substitute methods may need to be developed to provide experience of rare conditions or unusual techniques. Distance-learning opportunities, whether employing television, radio or other means of communication, will be especially helpful in continuing education, providing many possibilities for qualified personnel to keep abreast of the latest developments.

5.2 Scientific discoveries and technological developments

Changes in the structure of education of oral health personnel will also be necessary to reflect the results of clinical research and the development of new, high-technology dental treatments for which there is likely, at least in industrialized countries, to be a significant future demand. In the medium term (10–15 years), developments in the fields of diagnostic methods, treatment, and preventive care, will probably include the following:

- Identification of risk factors for dental caries or for periodontal tissue destruction and methods to identify patients at risk.

- Development of biochemical substances for inclusion in toothpastes and mouthwashes to support prevention of plaque and of calculus formation.
- Development of biochemical therapies for a range of diseases of the oral mucosa.
- Development of biocompatible materials for restorative and prosthetic procedures, implants and aesthetic dentistry.
- Development of methods and materials that will support regeneration of periodontal tissues.
- Application of advances from various scientific disciplines, including genetics, immunology, microbiology and nutrition, to the solution of problems in the diagnosis, management and prevention of oral diseases and disorders.

6. STRUCTURES FOR THE FUTURE EDUCATION AND TRAINING OF ORAL HEALTH PERSONNEL

A team approach to oral health practice will require a similar approach in education, encouraging cooperation both within the oral health team and with other health scientists. This approach has the following advantages:

- The students gain respect for each other and learn that good cooperation is essential for carrying out their future tasks.
- Creation of partly integrated curricula is facilitated, thereby allowing more natural, and more flexible, career development within the educational system.
- Non-academic cadres are provided with immediate and easy access to the latest results and innovations in research carried out by academic staff.
- Institutions can be run more economically; integrating study plans and timetables allows many basic, but expensive, installations and equipment to be put to full use during the whole year.

It is apparent that this educational structure must have the characteristics of flexibility and ease of adaptation to changing needs. Any proposed structure should be able to fulfil the educational requirements of all members of the oral health care team. Thus, it should not only cater for personnel who will carry out

tasks of differing complexity, but should also meet their career-long requirements for continuing education.

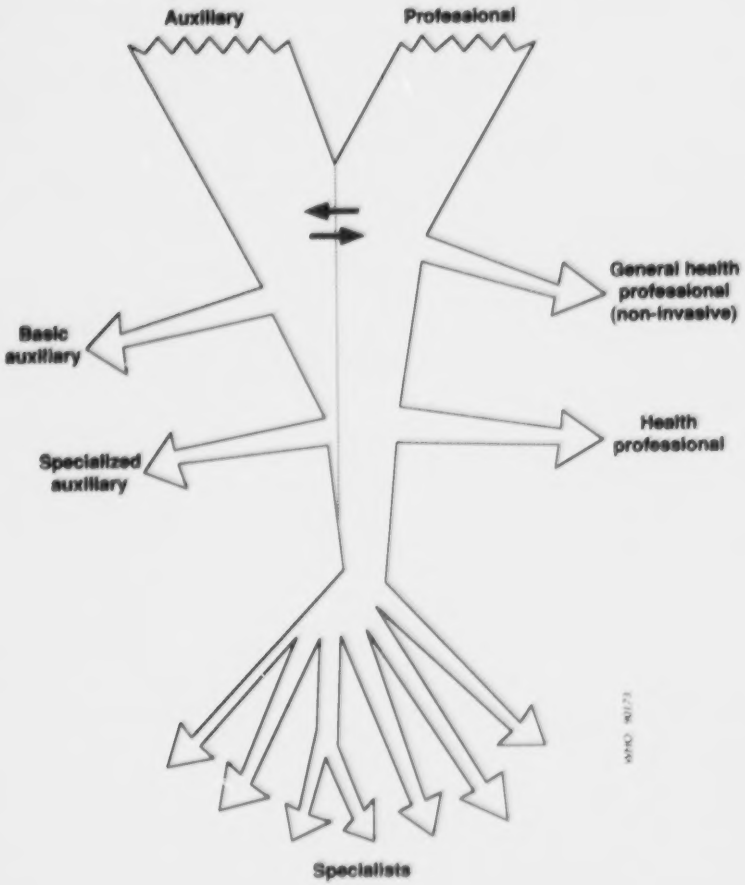
Oral health care will become increasingly closely related to general health care. Accordingly, the educational setting for oral health personnel should be one that enables close links to be established with teaching and research staff in the biomedical, social and clinical sciences. Isolation of oral health education from other major health care disciplines would be disastrous.

Educational systems vary considerably from country to country, and some existing structures may be less readily adaptable to future requirements than others. It is important that national circumstances be allowed to guide the planned rate of changes in oral health education, so that the supply of appropriately trained personnel keeps pace with the new challenges they will face in health care.

In giving consideration to these principles, several important themes appear worthy of further development. The modular approach makes it possible for an individual to undertake courses or other learning experiences in such a way that specific components can be built up gradually into a pattern appropriate to whichever sector of the health care system that individual wishes to enter. This approach also enables transfer to be effected with reasonable ease from one sector to another and can facilitate movement of health professionals between countries. The health sciences approach, which can be organized on modular lines, offers a common course for all prospective health professionals, with branching, lateral movement and specialization possibilities made available at particular points in the overall programme (see Fig. 5). Such a course would generally be expected to cover a period of some years. Pragmatically, development of this approach could be based initially on present requirements for medicine and dentistry, with other health-related disciplines incorporated into the structure in a planned way over a transitional period. Those destined to become auxiliary personnel could participate in the courses, particularly of a preventive and community-oriented nature, most suited to their requirements. The extent to which there could be overlapping between courses for different types of health scientists or auxiliaries could be determined by each country to satisfy its own requirements.

In addition to the specific content of courses within the health sciences approach, whether or not organized along modular lines, certain topics will deserve greater emphasis in the future. It is important that health sciences students are stimulated to engage in

Fig. 5. Schematic representation of the health sciences concept



debate and discussions with teachers and with students in the arts and humanities as a means of broadening their outlook on life. More attention should also be given to the inclusion of problem-solving projects, to the development of planning and managerial skills, and to the integration of behavioural and basic biomedical sciences into the health care agenda. In almost all countries, the features

considered necessary for the education of oral health personnel are those found most characteristically in a university setting.

In preparation for the changes envisaged in the types and mix of oral health care personnel, each country should review the appropriateness of its existing educational programmes and question whether these are adequate to meet future needs. Because of the inevitable overlap between oral health and general health, there should be interdisciplinary debate to examine the feasibility of close integration and new educational structures for the whole of the health care sector.

7. DEVELOPMENT OF CURRICULA FOR THE EDUCATION AND TRAINING OF ORAL HEALTH PERSONNEL

Regardless of the type and mix of oral health personnel judged by a particular country, region or educational organization to be ideal, and of the structure within which personnel are to be educated, it is essential to develop curricula that are appropriate to local oral health care needs, demands and resources. It is also essential for curricula to be sufficiently flexible to accommodate periodic changes in those needs and demands.

There is no single standard method for developing curricula and those responsible for doing so must take into account their own particular circumstances. However, one approach that has been found to be helpful is that described for a medical model by Guilbert (*8*) and modified to some extent for oral health purposes by Allred & Hobdell (*9*). This involves the specification of objectives expressed in performance terms and designed to provide a starting point for determining the appropriate content and learning activities of courses. Such objectives can also help to provide guidelines for the assessment of students by methods that are the most suitable for the course being followed.

Different categories of oral health personnel will require different educational objectives, both for initial and for further education. An example of a list of such objectives is provided in the Annex to this Report. This is not intended to be a complete list, or to place the objectives in any order of priority, or to be suitable for all circumstances or for all categories of oral health personnel. It is offered as a potentially useful starting point from which a range of

objectives might be developed to suit particular combinations of circumstances. Modifications will be required, for example, according to whether a curriculum is being developed for auxiliary personnel, for specialist training, or for the continuing education of general practitioners.

The formulation of objectives may also provide some indication of the qualities that should be sought in the various categories of oral health personnel, and thus form a basis for the development of rational recruitment and selection policies.

Because of the changes that occur in oral health needs and demands, curriculum objectives should be kept under regular review. This will lead to their adjustment in order to meet new requirements from the perspective of future service provision but should also include feedback from students so that improvements may be made that will facilitate learning. It is important that assessment procedures are based on the same educational objectives and philosophy upon which the curriculum is founded.

The strategy for introducing and implementing curricular developments should incorporate discussion among those who will use their teaching skills to help students to learn and to meet objectives. It is also important that any strategies or innovations adopted should be subject to a valid method of evaluation, the results of which are made readily available to others.

Many factors other than the formulation of educational objectives contribute to a successful curriculum. Every effort should be made to implement proven educational concepts and teaching methodologies, and personnel involved in teaching should be encouraged to participate in staff development programmes, to initiate innovative and flexible courses and to improve their understanding of the learning process.

8. SETTING EDUCATIONAL STANDARDS AND MAINTAINING THEM FOR A LIFETIME OF PRACTICE

Educational standards should be monitored in terms of both the content and the outcome of the courses and learning experiences provided. It is not always the case, however, that current standards reflect both present and future societal requirements. It is primarily the role of the responsible educational organization to develop the necessary standards, together with methods of assessing whether or

not those standards are being reached; it is valuable to seek the views, or more direct involvement, of, for instance, public health agencies, national dental associations, funding agencies and licensing bodies. Indeed, in certain circumstances oral health care requirements are inadequately served by reliance upon the educational organization alone and other bodies would then have a clear responsibility to create an appropriate mechanism for the establishment and monitoring of standards.

The pace of change in oral health and disease in all parts of the world is such as to emphasize the need for existing practitioners, in whatever branch of the health care system, to update their knowledge and skills so that they can provide a service to the population that matches informed expectations. Serious consideration should be given to the issue of regular relicensing of practitioners on the basis of proven involvement and assessment, including self-assessment, in programmes of continuing education. Responsible bodies should ensure that all oral health personnel, including those with teaching duties, have—and take—the necessary opportunities to maintain and develop their expertise, and that they can demonstrate a satisfactory level of achievement.

Whether a course sets out to establish basic educational standards, or to provide for specialist training or continuing education, the principle still applies that the methods used to establish standards should relate to the objectives set.

9. THE FACILITATION AND PLANNING OF CHANGE

The oral health sector has not excelled in planning the quality and quantity of oral health personnel. There are numerous examples of under- or over-production of personnel and of production of categories of personnel inappropriate to existing care facilities or to the needs of the population. In some countries, new dental schools are established in an uncoordinated manner, with central health authorities powerless to prevent this happening. Even when they are able to control the planning of new dental schools, such authorities do not always demonstrate good judgement. On the positive side, France provides an example of very careful planning of the production of dentists, with excellent consultation between school authorities, the national dental association, and the Ministries of Health and Education. Even in this case, however, it is important to

ensure that the appropriateness, as well as the number, of new oral health practitioners is being adequately reviewed and that all relevant factors—disease trends, new technologies, economic considerations and population demands—are included in the process.

Because no country appears to have succeeded in making planning a totally effective procedure, its value might well be questioned. However, the present emphasis on primary health care strategies, embodying more intensive preventive care, the principles of healthy life-styles and self-care, and greater involvement of communities in decision-making on health matters, is having a fundamental effect on health personnel requirements and thus makes the need for careful and effective planning even more pressing. This is as true for the oral health sector as it is for health care in general.

Equally, changes in disease status and care technologies, whether or not related to primary health care strategies, demand that adequate planning be undertaken in order to avoid a large surplus, deficiency or inappropriateness of health personnel. Procedures exist that enable a large number of assumptions to be made for the present and for the medium- and long-term future. However, even when the need has been established and the mathematical tools exist, it is important to ascertain exactly how the necessary changes are to be implemented.

The ability of health care systems to adapt both managerially and financially to changes will vary widely. New knowledge, techniques and treatment emerging from scientific and clinical research lead to improvements in the management and prevention of disease, though sometimes give rise to increased costs or unforeseen medical effects. Expectations of what health care should mean to a community increase as individuals gain greater access to information and acquire more knowledge.

Educational systems and institutions should provide leadership and evolve in response to these developments, ranging from ideas and innovations that emerge from within the organization to those resulting from pressures put upon them by governments, whether these be based primarily upon precepts of an educational or an economic nature. The resulting changes, if any, are reflected in the extent to which curricula are altered, research is encouraged, accountability is sought and the achievements of staff and students are monitored, particularly in respect of their effects on the health of the population within which they work. If no changes occur, or if the

changes effected are contrary to the major demands of society, educational organizations will rapidly lose credibility.

Change in educational systems depends primarily upon the need for change being recognized by those who are in positions of influence, either within or outside the systems. It is absolutely essential that these influences are coherent and coordinated and therefore that there is constructive debate involving all those bodies with an interest in the results of change. Consensus about the necessity for change should be arrived at by open discussion of problems and their possible causes and by identification of potential solutions. Teachers themselves have a special responsibility for initiating and catalysing the process of change as they have the most immediate access to new knowledge and concepts.

Grant & Gale (*10*) have described the principal dimensions of a strategy for change as being concerned with the following perceptions among those with a major interest in the process and results of change: gain and loss (in self-esteem, security or satisfaction), ownership (in relation to genuine involvement in strategy formulation), leadership and power. The last two qualities are not necessarily found in the same individuals. While there is no reason why leadership should not manifest itself in many people at any level of involvement, power tends to belong to a few, and those who exercise it should remember that enforcement of change is not necessarily enthusiastically received by the numerous personnel who are required to implement new concepts or work towards new goals.

Once the need for change has been established and the important elements to consider in the strategy required to effect change have been recognized, further factors must be taken into account. These include ensuring that a structure exists within which change is possible and allowing the necessary time for inquiry, negotiation and development. An individual or a small group should be charged with planning and implementation. During discussion with those whose role it will be to pursue any new policy, resistance to change may be encountered, and any fears expressed in this context, such as devaluation of skills, should be addressed by careful explanation of what is intended. Once a new system is introduced, it is essential to ensure that it functions as required and that the personnel involved are providing the necessary opportunities for learning. Efforts to meet the new expectations must be supported and the need for any major amendments should be considered after appropriate evaluation of results.

It has been argued (*11*) that, especially where government support for health services, medical manpower planning, medical schools, universities, and accrediting and licensing activities is extensive, it is essential to take advantage of such support for the changes that are thought necessary. Other extrinsic factors identified as important to the process of change are the influence of basic science research, societal pressures, specialization, the nature of funding and financial resources, political will and leadership, and legal considerations. Within an educational organization, important factors that influence change include teaching methods, learning opportunities, assessment procedures, facilities, educational research, community orientation, problem-oriented lifelong learning, student motivation and concern for fellow human beings (*11*).

Clearly, the process of change is dependent upon recognition of the interaction between various interested parties, both outside and within dental educational institutions. It is therefore important that dialogue is established between the various parties so that coherent strategies can be developed. Within the context of established responsibilities, however, it might be possible to identify the areas in which specific leadership and action are required if the change process throughout is to have the overall desired effect. Some of the tasks that would appear to be important and necessary in this respect are as follows:

- Evaluation and future projections of trends in disease distribution and management, population demography and public expectations for oral health care should be made.
- Agreement should be reached on the numbers and types of oral health personnel that will be required to meet future needs within particular regions or countries.
- Schemes should be drawn up for the appropriate education and training of the different types of oral health care personnel, and for the integration of their training with that of other medical personnel, and means should be established for their effective professional registration, regulation and disciplinary control.
- Clear statements should be made concerning the curricular guidelines and objectives for the education and training of oral health students, appropriate courses and learning opportunities should be devised, and means should be established for the effective evaluation of courses and for the assessment of students.

- Goals should be formulated that will encourage the pursuit of excellence, flexibility and new initiatives in the education of oral health personnel.
- Teachers of oral health students should be encouraged to review and renew their curriculum objectives and processes, to undertake curriculum initiatives and to evaluate them, and to participate fully in opportunities for their own professional development and re-education.
- Relevant and effective programmes should be established for the educational renewal and retraining of existing dental practitioners and their auxiliary staff.
- Procedures and requirements for the recruitment of oral health students and their teachers should be reviewed, departmental structures should be rethought, and the full integration of education for oral health personnel should be pursued in a framework encompassing the education of all health personnel.
- Flexible and sensitive procedures and practices should be adopted to ensure that new educational initiatives are not stultified and that resistance to change is overcome.
- Emphasis within health policies and the health care system should shift from one of dental repair to the wider context of preventing oral disease and thereby to the further promotion of oral health.
- Discussion should be promoted on the interaction between, and interdependence of, education for oral health personnel and the pursuit of research into oral disease, health services and the educational process.
- The general public should be kept informed about the need for changes in the education of oral health personnel and should be encouraged to participate in discussions about the direction and extent of such changes.
- Funding bodies should be informed of the new directions for the education of oral health personnel, so that support can be channelled accordingly.
- Discussions should be pursued with health and scientific personnel in related fields concerning the potential benefits of, and need for, integrated basic health science courses.
- Forward planning in relation to the future demand for health services, and opportunities for interaction between, and integration of, different types of health personnel should be pursued with a broad range of interested individuals and organizations.

The activities described above will require different degrees and levels of involvement of a wide variety of bodies with responsibilities and interests in the need for, and the effect of, changes in dental education. Among these are: appropriate government ministries, national and international dental associations, responsible licensing and regulatory bodies, universities and other educational organizations, international agencies, supragovernmental, governmental and nongovernmental funding bodies, teachers, dental practitioners, dental schools and relevant medical or other faculties, dental students, research agencies, teachers of medicine and science, specialist societies or groups, accreditation bodies, and the general public through appropriate groups.

Since oral health is an important aspect of health in general, it is the view of the Expert Committee that this process should be established nationally in all Member States with the least possible delay. Careful thought should be given to the most effective ways in which the various interested parties can be guided into interdependent discussion that will enable appropriate changes to be brought about in the education of oral health personnel and thus lead to the greatest improvement in the oral health of the population.

10. RECOMMENDATIONS

1. Member States have recognized the need to collect data on oral health status at frequent intervals as part of the process of monitoring their oral health situation. They are now called upon to use this information to design future health services, to recruit the personnel required to provide the services needed, and to adopt the educational approaches that will produce a workforce fully capable of exploiting future opportunities for improving the oral health of their people. Urgent consideration should be given to the extension of information systems by countries, by regions and on a worldwide basis, to incorporate a wider range of oral diseases than hitherto, including oral cancer and developmental anomalies, and to give attention to the acquisition of cost-benefit data.

2. In view of the extensive changes taking place and envisaged in disease patterns, scientific and technological developments, and the aspirations of populations for improved health, the content, structure and scope of educational arrangements for the appropriate

preparation of all health personnel should be subjected to immediate review by Member States.

3. Member States should now take appropriate steps to investigate the desirability of adopting a multidisciplinary approach to the development of oral health professional and support personnel appropriate to national needs in both quality and quantity. It should be a fundamental principle of such planning that the epidemiological data used are based on standard WHO and, where applicable, FDI procedures. The Expert Committee recognizes that different time-scales and degrees of flexibility will apply in different countries but believes that it is essential to pursue the long-term objective of developing schools of health sciences for the education of all health personnel. This requires a concerted, renewed attempt to explore the concepts involved, in order to create a more efficient system within which appropriate health personnel can be trained. It is clear to this Committee that the educational opportunities required for oral health personnel in the future are largely those commonly associated with a university-level institution.

4. An essential step in the process of change is the formulation or reformulation of relevant educational goals and curricula through which these may be attained. Responsible bodies involved in the education of all oral health personnel should ensure that immediate consideration is given to these issues and that appropriate mechanisms are established for their adoption and evaluation.

5. It is imperative that restyled educational systems for oral health personnel should adequately incorporate new and relevant scientific and technological knowledge. Full advantage must also be taken of new styles of teaching and learning, based on such features as modular patterns, performance-simulation training, problem-solving approaches, and distance-learning methods. A well-planned informatics component should become an indispensable element of such courses.

6. Vigorous and continuous staff development programmes should be established by all educational authorities with responsibilities for oral health care personnel, in order to address the successful implementation of newly designed and appropriate curricula, the requirements of the whole educational process, and the improved understanding of teaching-learning interactions.

7. Member States are urged to give high priority to a forward-looking education policy for existing and future oral health

personnel. Governments should ensure that adequate opportunities and funding for essential retraining are made available and should give immediate attention to the development of sensitive plans for continuing education, methods for assessment of its value, and mandatory schemes for relicensing of practitioners.

8. By the year 2000, Member States should have established means whereby the orderly and appropriate establishment of schools for the education of oral health personnel is under careful surveillance, possibly by requiring a "certificate of need" to be obtained. The present disordered proliferation of dental schools in some countries is to be deprecated, and the waste of resources occasioned by unplanned activity of this type should be recognized. Steps should also be taken to ensure that the skills developed are appropriate to oral health needs and that the quality of education achieved at each level is universally consistent.

9. The Director-General of WHO should consider the desirability of establishing an advisory network whereby experience and expertise can be harnessed in support of Member States and their educational organizations wishing to take full advantage of the opportunities to redesign their approach to oral health care provision. The preparation of curricula, staff development programmes and the planning of the type and mix of oral health personnel appropriate for the situation in individual countries will be assisted by such consultative advisory groups. Expansion of existing international exchange programmes for staff and students involved in research and in the education of oral health personnel would also encourage a coherent global thrust towards "Health through oral health" and coordination of standards.

10. During the development of these recommendations for the oral health sector, it has become apparent that there is an urgent need to investigate further the health sciences school approach for the education of all health personnel. It is strongly recommended, therefore, that the Director-General of WHO should consider establishing a multidisciplinary group of experts to report on the ways in which this concept should be further developed.

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Annex

EXAMPLE OF A STATEMENT OF THE GENERAL AIM AND OBJECTIVES FOR A FIRST COURSE FOR ORAL HEALTH PROFESSIONALS SUITABLE FOR THE EARLY 21st CENTURY

Overall aim

On completion of the course, students should be able to demonstrate the knowledge, understanding, skills and attitudes necessary for them to make a significant and continuing contribution to the preservation and maintenance of acceptable oral health and function, as an integrated part of general health, for each member of the community. This contribution is expected to embrace the following elements:

- diagnosis and treatment planning;
- provision of basic forms of dental care and some advanced treatment;
- management, coordination and leadership of teams involved in the promotion of oral health care, and advice for related health care teams;
- provision of an information resource for all those involved in health education oriented towards oral health.

Objectives

A. Knowledge and understanding

On completion of the course a student should be able to demonstrate knowledge and understanding of:

- current basic terminology of dentistry and related subjects;
- application, integration and relevance of the general principles of medical and allied sciences to oral health and disease;
- the process of scientific inquiry;
- features of common oral disorders and diseases;
- features of those uncommon oral disorders and diseases that have potentially serious consequences;
- interrelationships between oral disorders and diseases and those that affect other parts of the body;

—features of those oral disorders and diseases that may have special significance for particular communities;
—interrelationships between the effects of medical and dental treatments;
—the main applications of particular medical and technical specialities as they relate to oral health;
—the present and potential roles of dental and health care personnel in the community, and their medico-legal and ethical responsibilities.
—the relevance to, and impact on, oral health of social, environmental and health policies.

B. Skills

At the end of the course a student should be able to demonstrate the skills necessary to:

—identify individual patients and population groups with oral disorders and diseases and make suitable arrangements for their investigation, treatment and management;
—carry out basic investigative and operative procedures;
—promote oral health and prevent oral disorders and diseases;
—communicate and work effectively with patients, health care workers and other relevant individuals, groups or organizations (including the mass media);
—obtain and efficiently record reliable information and assess it objectively;
—apply knowledge and understanding of dentistry and other aspects of health care in finding the most suitable solution to clinical problems in the interests of both the individual and the community;
—analyse and interpret the results of relevant experimental, epidemiological and clinical research;
—undertake self-evaluation of knowledge and skills;
—organize, manage and evaluate health care resources effectively and efficiently.

C. Attitudes

At the end of the course a student should have been stimulated to:

- apply current knowledge of oral health and disease and related topics in the best interests of individual patients and the community;
- participate in continuing education concerning oral health and disease as a component of professional commitment and maintain a critical but open-minded approach to new information;
- participate in the scientific investigation of oral health and disease and be prepared to apply the results of research to health care;
- seek to improve awareness of, and provide solutions to, oral and related health problems and needs throughout the community;
- keep abreast of changing patterns of knowledge and practice in dentistry and oral health;
- maintain a recognized standard of professional ethics and conduct, and apply these in all aspects of professional life;
- be aware of the oral health worker's role in society and take personal responsibility for that role;
- recognize his or her own limitations and be adaptable and flexible in the face of changing circumstances.

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This report contains the deliberations and recommendations of a WHO Expert Committee responsible for considering the implications for the education of oral health personnel of changes in both oral disease patterns and demands for treatment. The Committee reviewed current trends in the prevalence of dental caries and periodontal diseases, the growing need for oral health practitioners to manage a wider range of oral problems, and the influence of these factors - together with scientific and technological advances - on future needs for different categories of personnel and on the educational requirements of those personnel. The desirability of modifying traditional educational techniques by introducing a multidisciplinary approach and more flexible curricula that can be adapted to periodic changes in need was emphasized. The Committee also stressed the necessity for continuing education as a means of maintaining standards among qualified personnel. Among the Committee's recommendations were continuous monitoring of oral health status in Member States, immediate review of oral health education, the adoption of new educational approaches, and the formulation, implementation and subsequent evaluation of appropriate educational goals and standards.

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